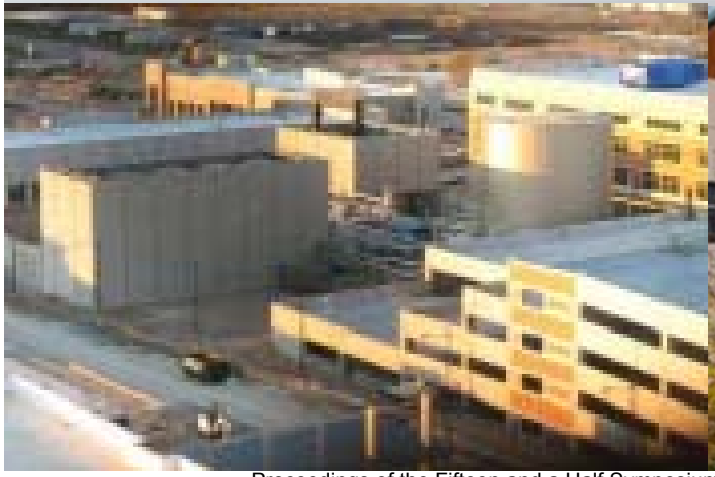


CHP: It's Time for Combined Heat and Power

Clean Air Through Energy Efficiency

December 19, 2007





Energy Reliability

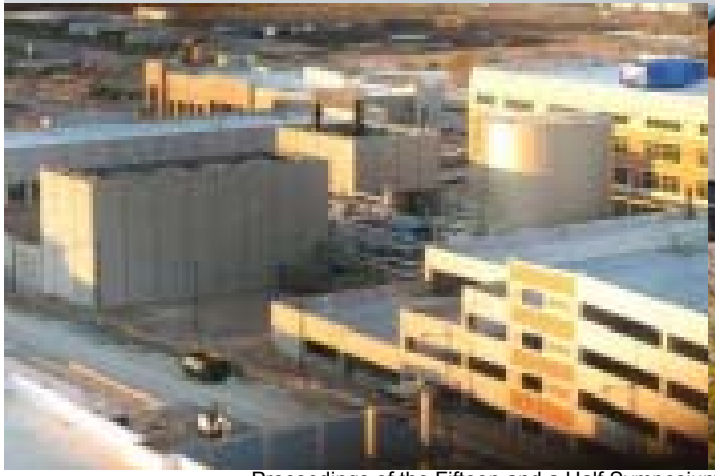
Energy Security

Energy Efficiency

Economic Development

Environmental Stewardship

Texas CHP Initiative



Overview

CHP: What is It?

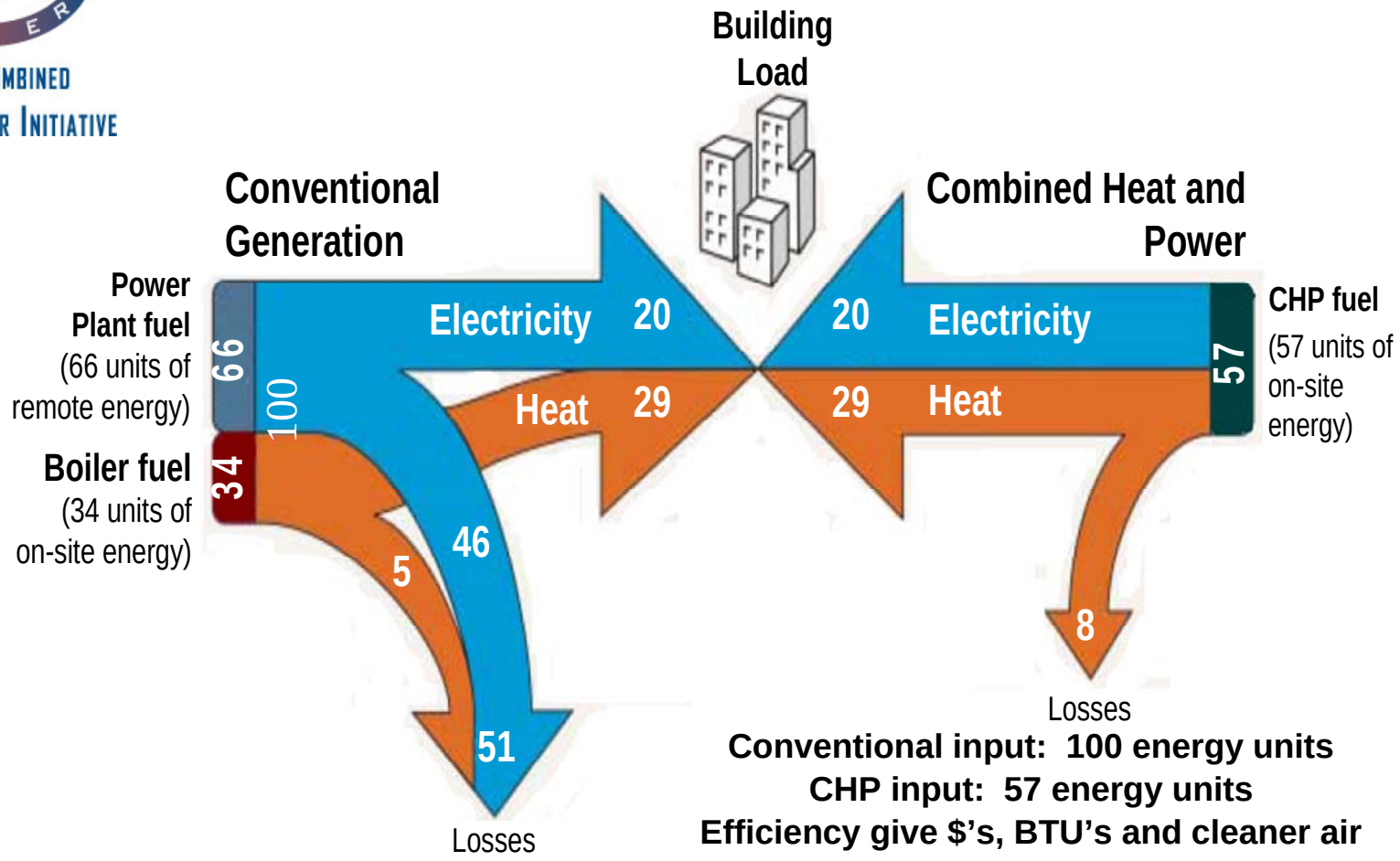
CHP: What are the Benefits?

- ✓Energy Reliability
- ✓Energy Security
- ✓Energy Efficiency
- ✓Economic Development
- ✓Environmental Stewardship

CHP: Pathway to Green Buildings

Texas Combined Heat & Power Initiative

What is Combined Heat & Power?



CHP is power generation and heat recovery at the point of use

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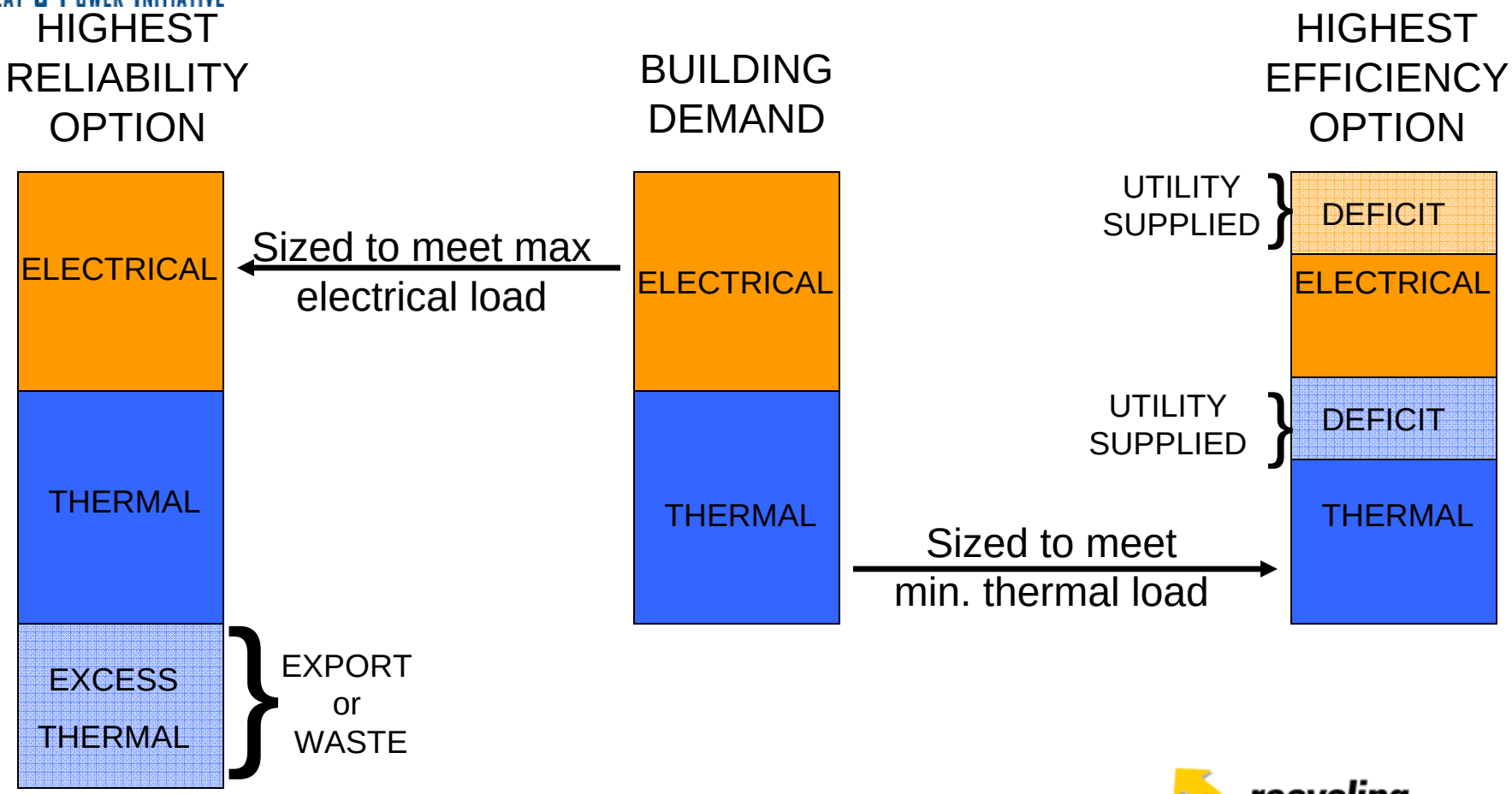
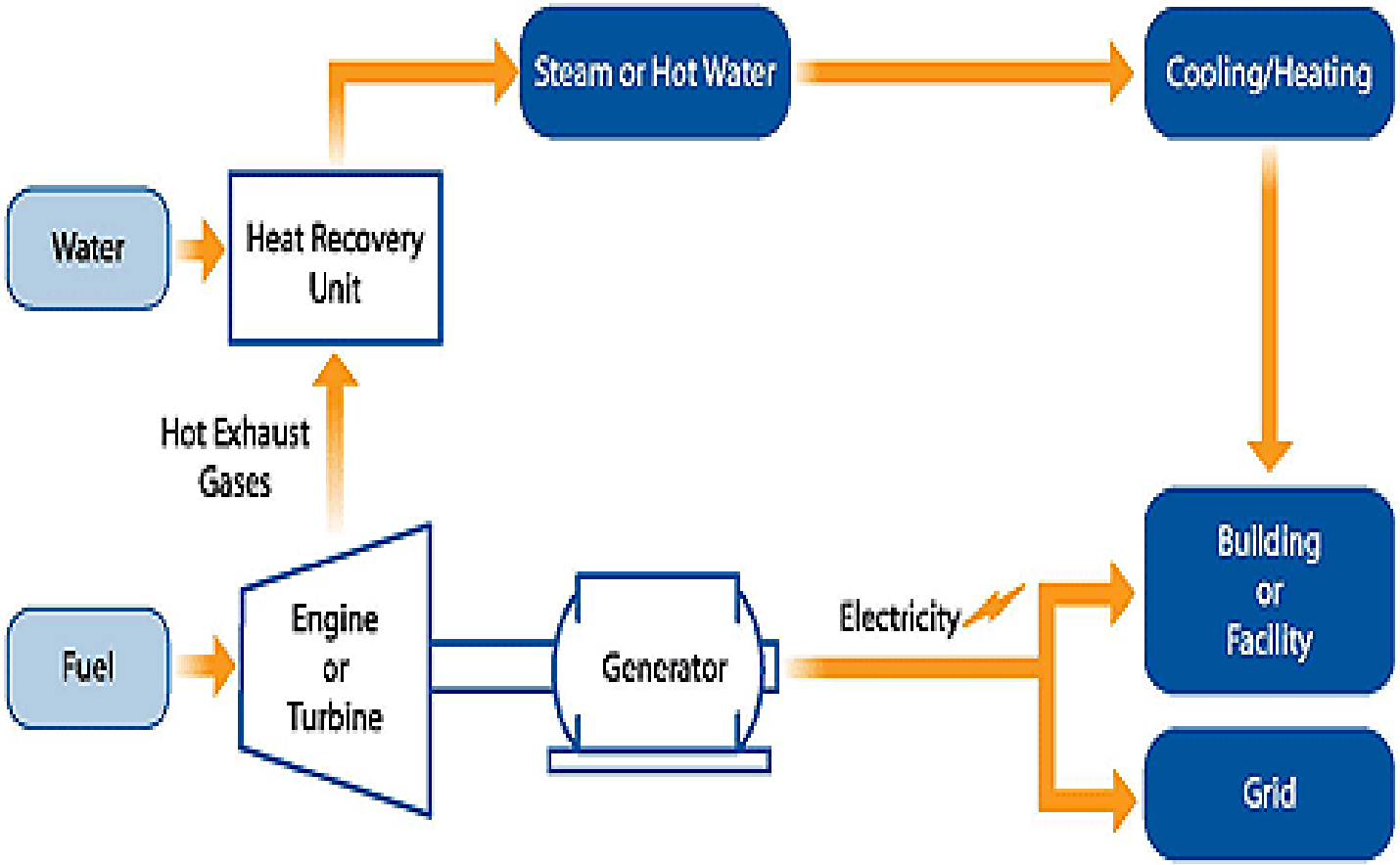
System Design Options



TEXAS COMBINED HEAT & POWER INITIATIVE



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CHP Thermal Technology

CHP has adapted thermal technologies to recycle waste energy from generation for business spaces and industrial processes

- Cooling and refrigeration
- Water and space heat
- Steam production
- Dehumidification

Thermally driven desiccant dehumidifier

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Energy Reliability

Combined Heat & Power provides significantly greater reliability than central generation and T&D that could prevent billions of dollars in outage losses every year

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Energy Security - Katrina and Rita: A Tale of Two Hospitals

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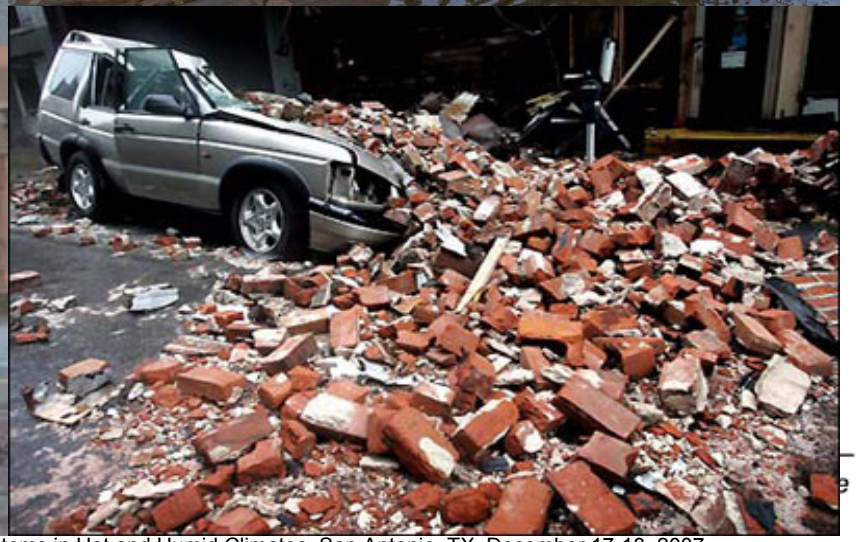

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Baptist Medical Center, Jackson, Mississippi

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Value of On-site Generation

Mississippi Baptist Medical Center

- remained open throughout to treat a high volume of patients
- provided emergency clothing, food, and housing for people displaced during the first night of the disaster
- received patients from other medical facilities not able to remain open
- helped emergency responders establish operations

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09/25/2005

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Memorial Hermann Baptist Hospital Beaumont, TX

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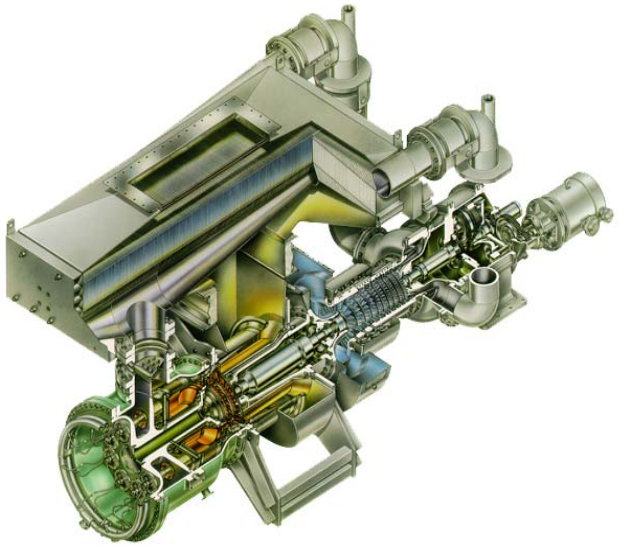
Energy Security

Combined Heat & Power can keep critical health and emergency services functioning…along with vital public and economic functions…during a natural disaster or terrorist attack



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Energy Efficiency

At efficiencies upward to 90% CHP DE can cut fuel consumption per unit of output to half or a third of conventional usage… especially natural gas supplies now in heavy demand

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Economic Development:

Combined Heat and Power

- ✓ Reduces the cost of new electricity T&D infrastructure
- ✓ Supports state and local job creation for Texas companies
- ✓ All at lower cost to electric utility ratepayers

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Development of a Portion of CHP Potential would Provide Significant Environmental Benefits

- Development of 1000 MW would result in[1]:
  - **24% less fuel use** than separate heat and power
  - A reduction in **CO2** emissions of **3.6 million tons/year**
  - A reduction in **NOx** emissions of **7,800 tons/year**
  - A reduction in **SO2** emissions of **13,700 tons/year**
- The CO2 emission reductions are equivalent to:
  - Annual emissions of **611,000** cars
  - Planting **978,000** acres of trees

1 Based on displacing the average fossil fueled central station generation emissions for Texas (eGRID 2000) and on-site gas boilers

CHP EPA COMBINED HEAT AND POWER PARTNERSHIP

TEXAS COMBINED HEAT & POWER INITIATIVE

Environmental Stewardship

Environmental Stewardship = **Energy Efficiency**
Fuel Diversity
CHP Distributed Energy

- **Reduces greenhouse gases**
- **Reduces criteria pollutants**
- **Conserves fresh water**
- **Husbands fuel resources**
- **Ready for bio-fuels and bio-fuel creation processes**
- **Cuts land-use impacts and NIMBY problems**

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Conclusion on Environmental Stewardship

Combined Heat & Power can generate increased electric power for our economy with significantly decreased environmental impacts

Twenty Benefits of Distributed Energy

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Energy Reliability

1. Improved power quality
2. Business continuity
3. Reduced grid congestion
4. End-of-the-wire supply
5. Short lead-time, off-the-shelf, modular technology

Energy Security

6. Reduced system vulnerability
7. Disaster Mitigation
8. Disaster Recovery

Energy Efficiency

9. Improved fuel efficiency (fuel economy)
10. Optimized use of scarce natural gas resources
11. Eliminates line losses

Economic Development

12. Lower cost for new electricity than new central generation and T&D
13. Improved energy cost predictability
14. Low ratepayer investment required (generation or T&D)
15. Creates new high-tech manufacturing sector, domestic and export
16. Creates local jobs for installation, operation and maintenance
17. Supports competitive electricity market structure

Environmental Stewardship

18. Reduced emissions per unit of useful output
19. Reduces land-use impacts and NIMBY objections
20. Reduces fresh water use

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Only FOUR of the Twenty Benefits Accrue to the User

Energy Reliability

1. **Improved power quality**
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The Others are PUBLIC Benefits…

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Energy Reliability

1. Improved power quality
2. Business continuity
3. Reduced grid congestion
4. End-of-the-Wire Growth
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Energy Security

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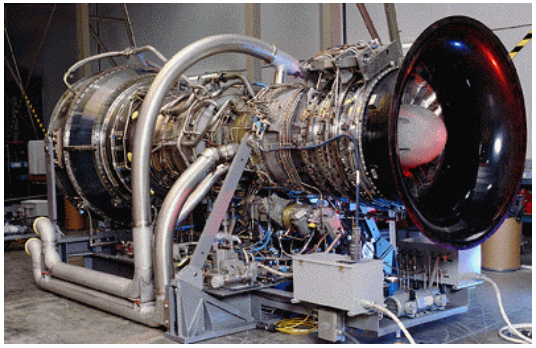
General Conclusion

It is very much in the PUBLIC interest to support CHP distributed energy… even if the private incentives are not sufficient to overcome the barriers



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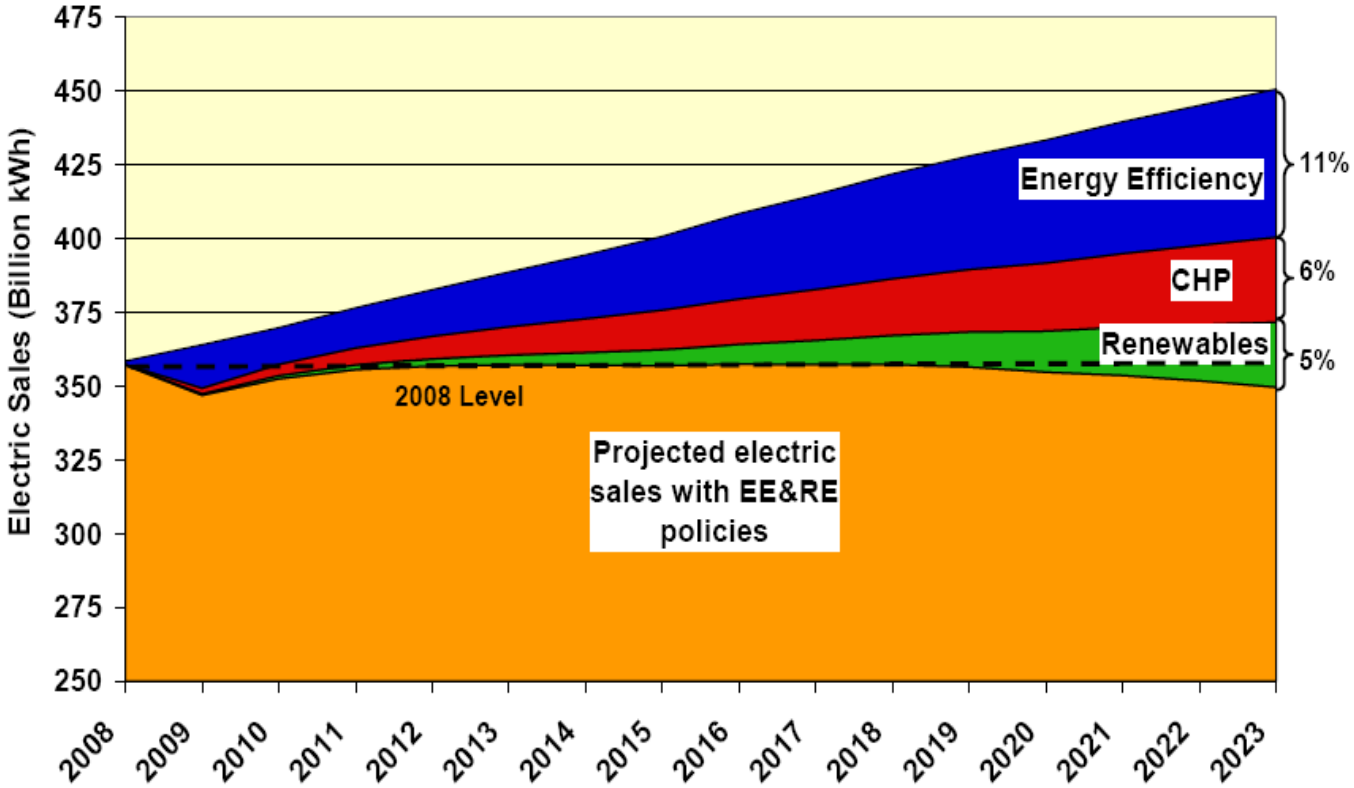
CHP Growth Potential

CHP can provide over 6% of the resource margin in Texas with the proper policies



Source: ACEEE 2007

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CHP Candidates

- Hotels
- Prisons
- Airports
- Schools
- Hospitals
- Grocery Stores
- Data & Call Centers
- Residential High-Rise or Campus
- University & College Campus
- Food Processing Plants
- Refrigerated Warehouses
- Emergency Management Facilities
- Manufacturing Plants (High Tech)

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TEXAS COMBINED HEAT & POWER INITIATIVE

Dell Children's Hospital Austin Energy District CHP

Components of CHP Plant

- 4.3 MW Mercury 50 Combustion Turbine
- 80,000 gallon Thermal Energy Storage Tank
- 1000 T Steam Absorption Chiller
- 1500 T Electric Chiller
- 1500 kW Stand-by Generator

Grid Synchronized April, 2006

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Dell Children's Hospital
Austin Energy District CHP

Hospital CHP Considerations

- **Cleaner, more reliable normal power**
- **Additional, more reliable backup power**
- **Ability to "Island" in event of grid failure**
- **Initial capital savings & Building operating savings**
- **Expandable in future**

Grand Opening June, 2007

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Dell Children's Hospital
Austin Energy District CHP

Benefits of CHP

CHP supplies 100% electricity

75% more efficient than grid

Lower emissions

Steam and chilled water provided

Peak-shaving storage tank

$18M capital input by AE

$7M capital savings

- **$5M to LEED Initiative**
- **$2M to medical enhancements**

LEED *Platinum* Application

TEXAS COMBINED HEAT & POWER INITIATIVE

CHP: What is Holding It Back?

✓CHP is regulated as an Electric Generating Unit (EGU) even though it provides other benefits:

- *eliminates inefficient boilers*
- *increases energy reliability & security*
- *reduces transmission losses*

✓CHP provides both "energy efficiency" & "renewable energy" but is not rewarded for either

✓CHP benefits Texas industry but is generally unknown to commercial enterprise managers

✓Capital investment in CHP is constrained by unpredictable returns due to volatile energy prices

✓The grid does not accommodate small resources

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Texas CHP Initiative Members

- **Members qualifications**
  - Pledge the CHP pledge: Mission Statement
  - Champion CHP as the most effective—efficient, economical, environmental energy option for Texas
  - Seeing Texas fully deploy CHP in all areas that proffer effective application of the technologies to provide energy security, protect the environment and present economic feasibility
- **Members**
  - Who, where, what
- **Membership Application**

TXCHPI Legislative Agenda

Legislative Action List and CHP Whitepaper

- Assured energy for life support, shelter, food, communications, …
- Support population and economic growth
- Bundle multiple energy loads and sources

Advanced in DE Technologies and Systems

- Customer choice among several winning solutions
- More efficient and cleaner
- Serve remote or “end-of-the line” customers.

Local Outreach and Technology Transfer

- Every community knows the benefits and solutions
- Ensure users maximize their DE benefits

Texas CHP Initiative Policy Analysis

Texas Combined Heat & Power Initiative

Twice the Power at Double the Efficiency: Providing Secure Energy in Texas With CHP

Prepared by the

Texas Combined Heat and Power Initiative

February 2007

Texas Combined Heat & Power Initiative

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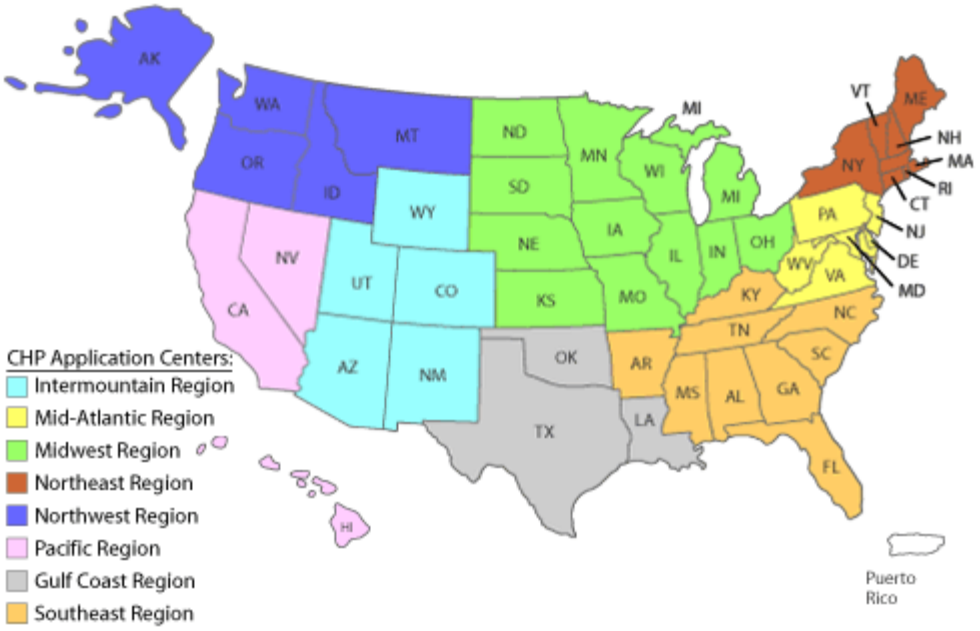
Technology Transfer Accomplishments

DOE Started 8 Regional Application Centers

Gulf Coast CHP Application Center at HARC

Daniel Bullock, Director
(281) 364-6087
dbullock@harc.edu

4800 Research Forest Drive
The Woodlands, TX 77381



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Questions?

TX HEAT POWER CHPI
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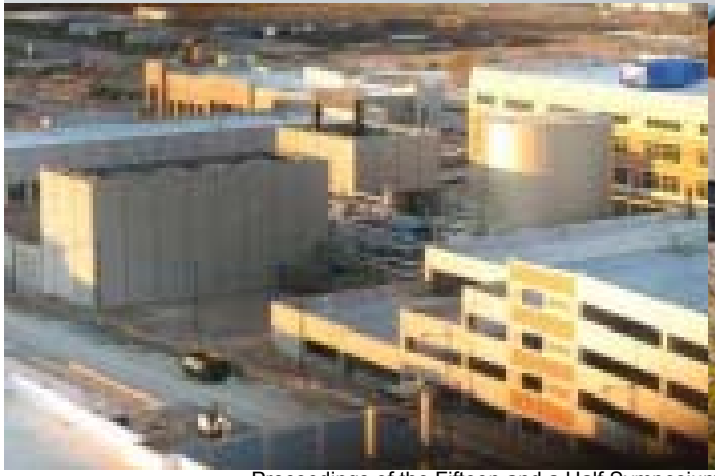



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